SATEVIS

BeanAir® Sensors Brand

α·INC

WIRELESS IoT Bi-Axis INCLINOMETER

QUICK START

USER GUIDE

MECHANICAL DRAWING

STEP FILE

SATEVIS® ALPHA-INC

SCALABLE MEASURING RANGE (±30° AND ±55°)

DATASHEET

IOT

IP67

WWW.SATEVIS-SYSTEMS.COM

1 MAIN FEATURES

Sensor resolution: (0.00183° ° for ±30° range, 0.00366° for ±55° range)

LoRaWAN® Protocol: 15km Radio Range *

Scalable Measuring Range: ±30° and ±55°

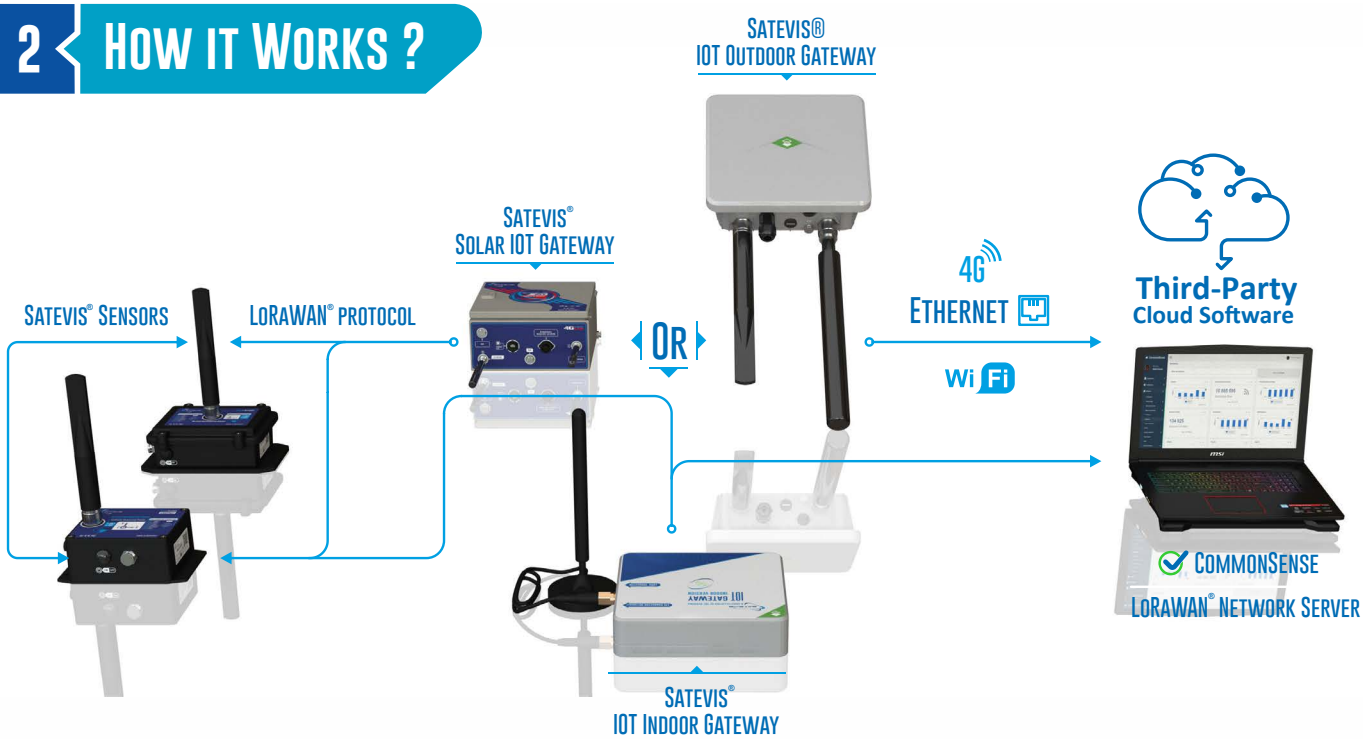
IP67 | Nema 6 / IP68 (M8 Connector cap mounted , self-fusing is used around antenna connector)

Excellent radio link.

Integrated battery pack

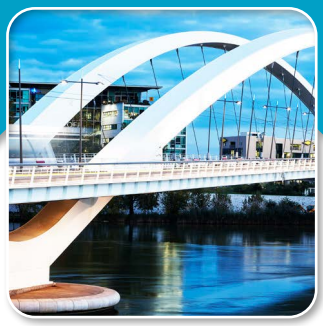
* 15km Radio range if the device is in Line of sight , sensor configuration: +22dBm Radio Power, +5dBi Antenna, Gateway is installed on a Mast, 25 meters Height, +8dBi Antenna Gain

2 HOW IT WORKS ?



3 APPLICATIONS

BRIDGE



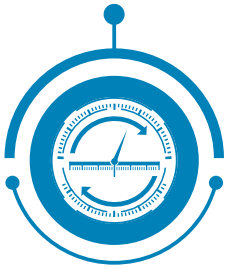
RAILWAY SLEEPERS

CRANE

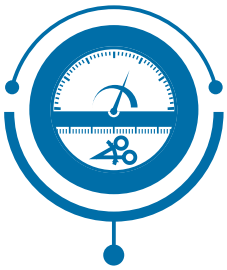
TUNNEL

CONDITION MONITORING

LAND SURVEYING



STRUCTURAL HEALTH MONITORING



TEST AND MEASUREMENT

CARGO SHIP

DAM

ANTENNA BASE STATION

CONSTRUCTION SITE

4 NON-CONTACT BUTTONS AND LEDS DESCRIPTION

"HELLO!" FUNCTION HELPS THE FIELD OPERATOR TO CHECK THE SENSOR INSTALLATION & CONFIGURATION

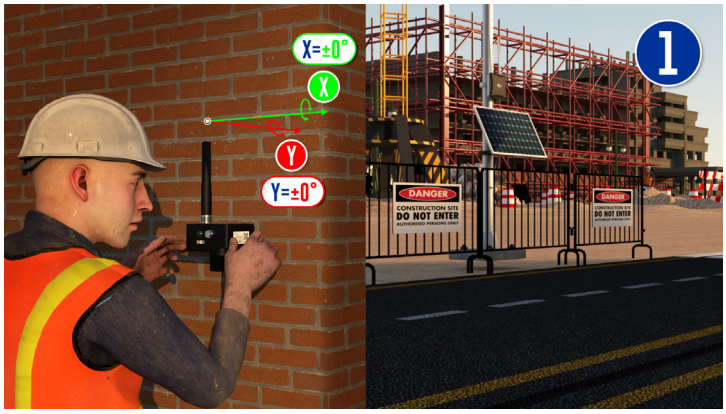
Caption1: After installing the Alpha-Inc inclinometer , the field operator can check at any moment if the sensor is working properly.

Caption2: By Holding the magnet on the 'Hello!' label for more than 10s, the sensor wakes-up and transmits to the Lorawan network the data measurement followed by the system diagnostic (battery status and network quality).

Caption3: The Activity Led blinks in green color, confirming that a data measurement is transmitted to the Lorawan network.

Caption4: The field operator can check on Satevis® Cloud software (or a third-party cloud software) if his sensor is working properly.

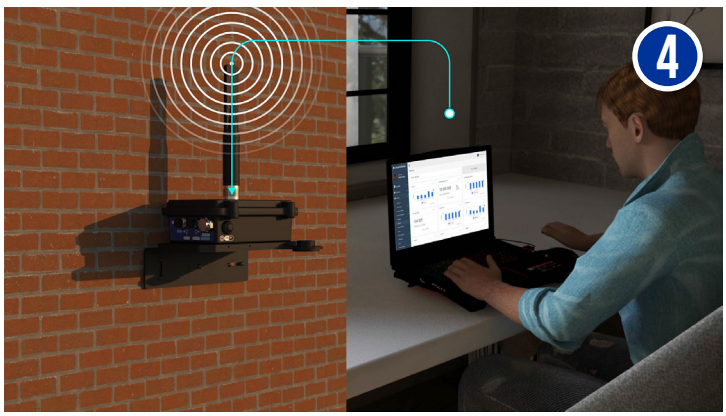
SENSOR ZEROING FUNCTION SIMPLIFIES THE SENSOR INSTALLATION



Caption1: Even if an angle bracket is used, it's sometimes difficult to bring a zero-offset on both X and Y axis . In some cases, the field operator can not spend too much time on this task.

Caption2: To enable the sensor zeroing function, hold the magnet on 'Sensor Zeroing" Label for more than 10s.

Caption3: The Activity LED blinks in blue, the sensor zeroing starts on both X and Y axis . When this process is done, the Activity led will blink again in blue color and transmits a data measurement to the Lorawan® network. If the sensor zeroing process is not done correctly (the device is moving) the Activity Led will blink in Red color.



Caption4: The Sensor-zeroing process can be also done remotely from the cloud software.

5 TECHNICAL SPECIFICATIONS

PRODUCT REFERENCE

SATEVIS-LORA-ALPHA-INC-MR-PS-RP-AG

MR– Measurement Range: 30B : Bi-axis ±30°/±55°	PS - Power supply : BP3S : Battery Pack with 3 Primary Cell in series (3 x 6.5Ah , 3S1P configuration) - Non Rechargeable battery pack
RP- Radio Power HP - High Power Transmission +22dBm LP - Low Power Transmission +14dBm	AG - Antenna Gain AG-2dBi-868: 2dBi Antenna for EU/IND Regions (Europe /India) AG-5dBi-868: 5dBi Antenna for EU/IND Regions (Europe /India) AG-2dBi-915: 2dBi Antenna for US/KR/AS/AU Regions (USA/KOREA/ASIA/AUSTRALIA) AG-5dBi-915: 5dBi Antenna for US/KR/AS/AU Regions (USA/KOREA/ASIA/AUSTRALIA)

Example 1: SATEVIS-LORA-ALPHA-INC-30B-BP3S-LP-AG-2dBi-868
Wireless Inclinometer with LoraWan connectivity, Bi-axis inclinometer with ±30°/±55° measurement range, Powered from Battery Pack 3S, Low Power Radio +14dBm, 2dBi Antenna for EU/IND regions

Example 2: SATEVIS-LORA-ALPHA-INC-30B-BP3S-HP-AG-5dBi-915
Wireless Inclinometer with LoraWan connectivity, Bi-axis inclinometer with ±30°/±55° measurement range, Powered from Battery Pack 3S, High Power Radio +22dBm, 5dBi Antenna for US regions

DATALOGGER / RECORDER

Datalogger Size	If 3 sensors Channels (Bi-Axis Inclinometer, 1 Internal Temperature) : 380 000 Log sessions per sensor channel If 5 sensors Channels (Example: Tri-Axis Inclinometer, 1 Internal Temperature, External Temperature, External Humidity) : 279 000 Log sessions per sensor channel
Logged Information	UTC Clock Data Measurement Monitoring Mode
Remote configuration from LNS	DataLogger Start/Stop/Erase
Download Method	From USB with Hypeterminal Software, CSV format

CONFIGURABLE SETTINGS FROM CLOUD SOFTWARE

Javascript formatter code	Free Javascript fromatter code to accelerate the integration of Satevis sensors in your own cloud software : - Downlink formatter code (Alarm Threshold, Measurement mode....) - Uplink formatter code(Data measurement)
Data Acquisition mode	Different measurement mode are available: Low Duty Cycle Data Acquisition (LDCDA), Measurement heartbeat 20s to 24 hour Alarm measurement mode, Measurement heartbeat 10s to 24 hour
Alarm Threshold	Three levels of Alarm Thresholds Minor Alarm / Severe Alarm / Critical Alarm
Scalable Mesurement Range	±30° , ±55°

INCLINOMETER SENSOR

Inclinometer Technology	MEMS Technology
Scalable Measuring Range	user-seletctable range ±30° or ±55°, with automatic range adjustment depending on the application
Sensor resolution	0.00183° for ±30° range 0.00366° for ±55° range
Noise density	0.0009 °/√Hz
Sensor Precision/Repeatability (full scale, 25°C)	±0.00183° for ±30° range ±0.00366° for ±55° range
Sensor Accuracy (full scale, @ 25°C)	±0.005° for ±10° range ±0.01° for ±45° range ±0.02° outside ±45° range
Offset temperature dependency (temperature range –25°C to +85°C)	±0.002°/°C
Offset LifeTime Drift (@25°C)	±0.05 °
Sensor frequency Response (-3 dB)	DC to 10 Hz for ±30° measurement range DC to 40 Hz for ±55° measurement range
Calibration	Factory calibrated on 9 references point : 0° absolute, ±5° ,±10°, ±30° and ±45° with calibration settings backed up on the sensor Flash memory. Calibration method used : Back-to-back calibration with an accurate reference sensor.
Sensor Zeroing function	Sensor zeroing can be done after Satevis Sensor installation. User need to hold a magnet on the label " sensor zeroing" for approx. 10s, zero-offset is the performed on all sensor axis X/Y

POWER SUPPLY

Integrated battery pack	Non-Rechargeable Battery Pack (3S1P configuration) - Lithium Thionyl Chloride Capacity 6.5Ah , Max Voltage 10.8Volts
Current consumption @ 3,3V	· During data acquisition : 15 to 20 mA · During Radio transmission : 80 mA for +22 dBm , 35 mA for +14dBm · During Battery Saver Mode : < 15 µA
External power supply	USB Power 5VDC. When the device is powered from USB, the internal battery pack is disconnected from the power path.

5 TECHNICAL SPECIFICATIONS

SATEVIS SENSOR CONFIGURATOR (FROM USB)

Configuration	Frequency Plan, Device EUI, AppEUI, AppKey
Firmware Upgrade	Firmware upgrade through the USB
Sensor calibration	Calibrations Points setup and Quick calibration

RF SPECIFICATIONS

LoRaWAN® Stack	LoRaWAN® V1.0.2 REVB CLASS A
Activation Mode	OTAA
LoRaWAN® Frequency Plan	Frequency Plan can be configured from USB: -Europe 868MHz - USA: 915MHz - Australia 915MHz - Asia 923MHZ - Korea 920MHz - India 865Mhz Important : Depending on the destination region, Satevis Device will be delivered with Antenna for 868MHZ Frequecies (Europe/India), or 915MH frequencies (USA/KOREA/ASIA/Ausrtalia)
TX Power	HP - High Power Transmission +22dBm LP- Low Power Ttransmission +14dBm
Receiver Sensitivity	-136.5dBm sensitivity for SF12 with 125KHz BW
Link Budget	158dB
Maximum Radio Range	- 15 Km in L.O.S. / Rural Environment - 2 Km in NLOS/ Urban Environment
Antenna	Waterproof N-Type Omni Antenna, Gain 5 dBi or 2dBi / VSWR ⩽ 2.0 Frequency range for AG-2dBi-868 and AG-5dBi-868 : 863-870 MHz Frequency range for AG-2dBi-915 and AG-5dBi-915 : 902-928 MHz Dimensions Ø22 x 64 mm for 2dBi Dimensions Ø22 x 180 mm for 5dBi

5 TECHNICAL SPECIFICATIONS

ENVIRONMENTAL AND MECHANICAL

Casing	Aluminum & Waterpoof casing Dimensions in mm (LxWxH): 151x130x55 mm Weight : 950g
IP | NEMA Rating	IP67 | Nema 6 / IP68 (M8 Connector cap mounted , self-fusing is used around antenna connector)
Shock resistance	100g during 50 ms
Mounting base	Screw mounting & magnetic mounting
Operating Temperature	-40°C to +75°C Sunshield should be used if the device is exposed to sun radiation from +68°C
Shielding	EMI SHIELDING GASKET
Relative Humidity	0 to 98 %RH
Norms & Radio certifications	·CE Labelling Directive R&TTE (Radio) ETSI EN 300 328 ·FCC (North America) ·ARIB STD-T66 Ver 3.6 HS Code: 9031.80.20 EAR99 ROHS - Directive 2002/95/EC

INCLUDED ACCESSORIES

1 x Battey Pack 3 x C-Size Cell - 6,5Ah (3S1P configuration)
1x Magnet for Sensor-Zeroing & Hello functions
2x M8 Cap for Power Supply & external optional sensor
1 x USB to M8 cable adapter, 2 meters length
1 x Self-amalgamating tape (25cm length)
1 x LoRaWAN® Antenna (see antenna options on reference builder)
1x Button Shield

AVAILABLE FUNCTIONS

ON/OFF	Mechanical latching Push button
Hello	Transmits Data on user request , works with a magnet pointing to Hello label
Sensor Zeroing	sensor zeroing on user request , works with a magnet pointing to sensor zeroing label
Multi color LED	Green: network connection, data tranmsision Blue: Sensor zeroing successful/Hello Message Transmitted successfully

OPTIONAL ACCESSORIES AND SERVICES

90° Bracket Mounting	90° Bracket mounting (with integrated eyelet) with 4 x M5 screws + Locknut Ref: SAT-BRACK-MNT
External Sensors	External Temperature and Humidity Sensor
Calibration certificate	Calibration certificate provided by Satevis A static calibration method is used on a granite surface plate DIN876 Ref: CERT-SATEVIS-INCLINOMETER

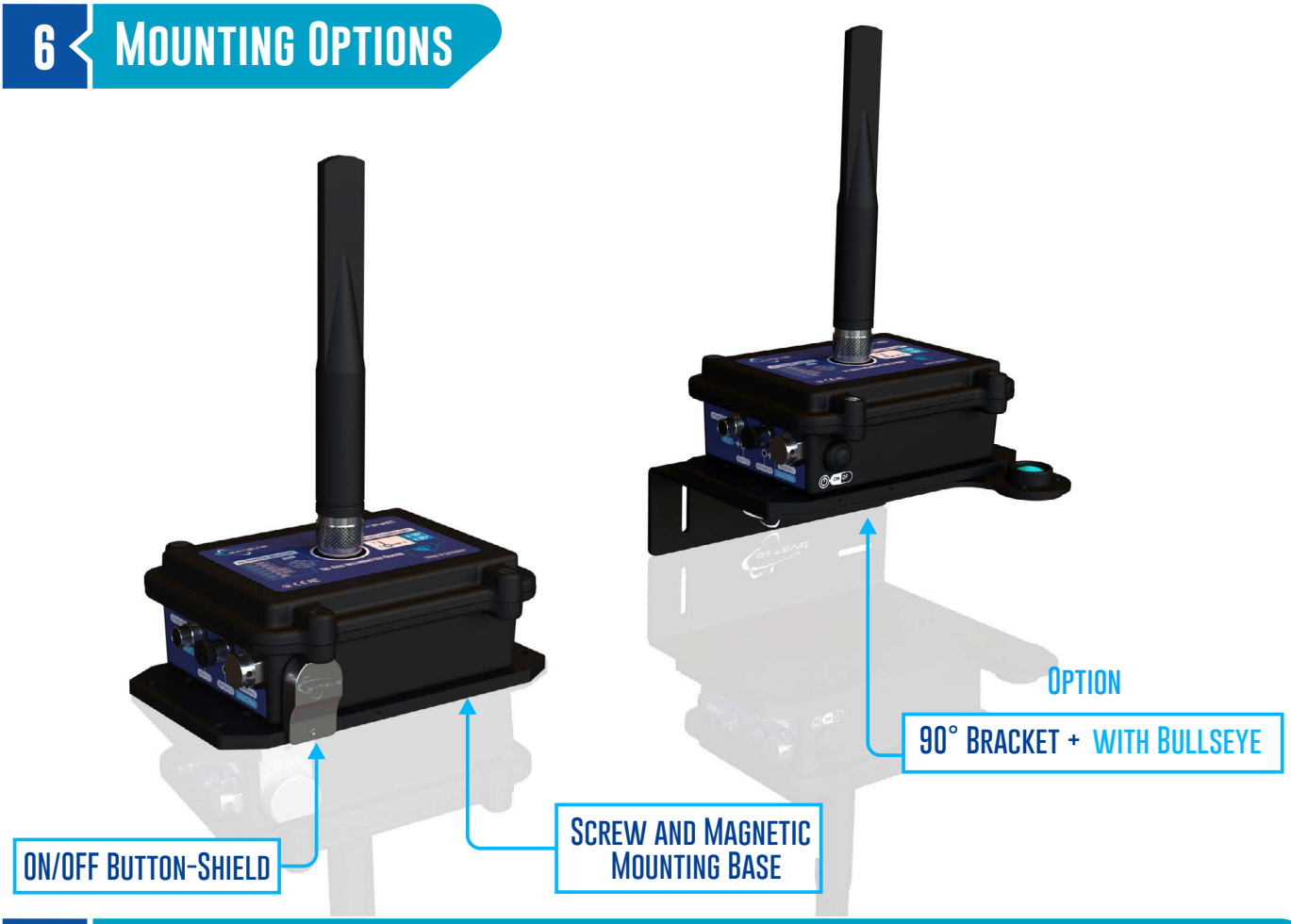
OPTIONAL EXTERNAL SENSORS

Temperature and Humldity sensor	Ref: B-TH-01-150-M8
Industrial Pressure sensor	Ref: SAT-EXT-TIR(available Q1-2025)
Industrial Water Level Sensor	Ref: SAT-EXT-WATER-LEVEL (available Q2-2025)

BATTERY LIFE WITH FOR DIFFERENT MEASUREMENT MODE

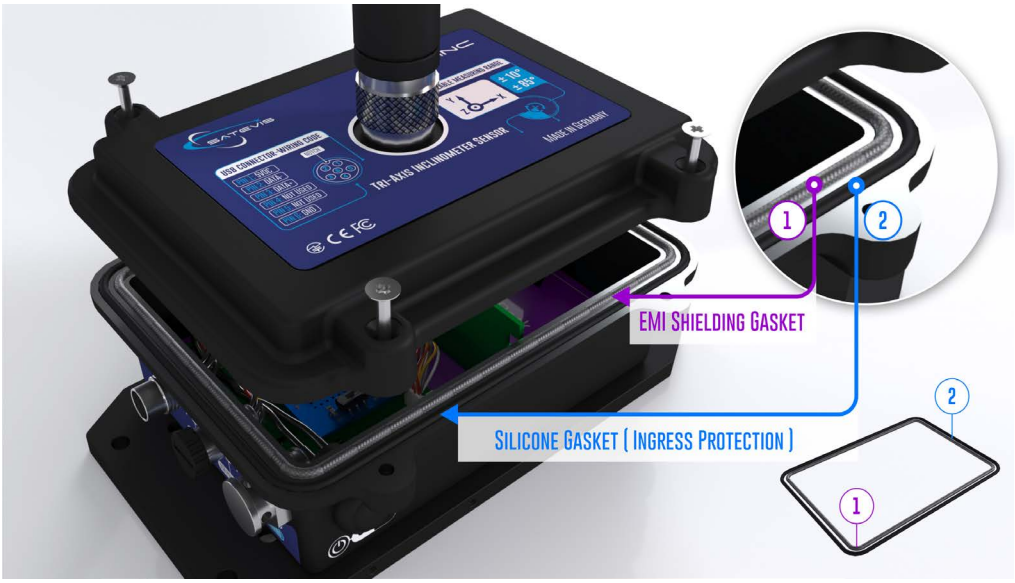
Measurement Cycle every minute	
Measurement Cycle every 5 minutes	
Measurement Cycle every hour	
Measurement Cycle every 4 hours	

6 MOUNTING OPTIONS



7 DESIGNED FOR HARSH ENVIRONMENT FROM COLD TO TROPICAL COUNTRIES

All Satevis® sensors designed with a Rugged and Waterproof (IP67) Aluminum casing and integrate a Protective Vent, with Humidity and Pressure compensation.

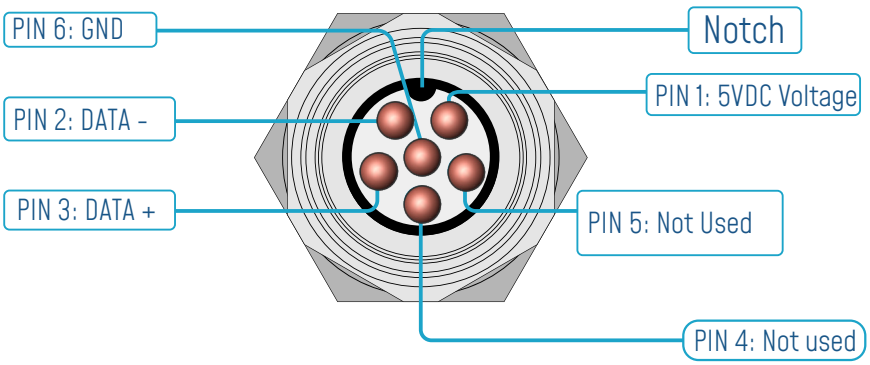


Satevis® Alpha-Inc comes with 2 levels of protection:

- IP67 Aluminum alloy casing.
- Electromagnetic protection with Shielded gasket on the lid.
- Ruggedized and ultra-low-power electronic design -40°C to +75°C.
- Humidity and Pressure Vent.

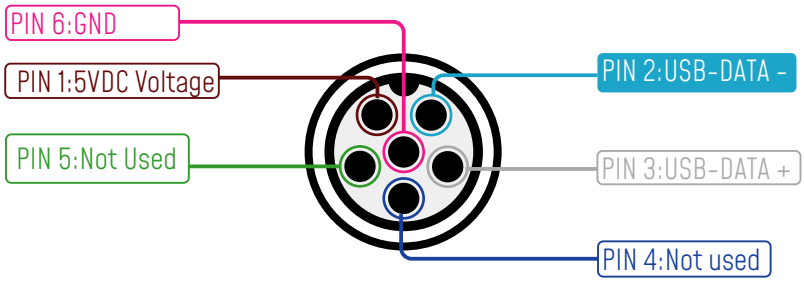
8 POWER SUPPLY

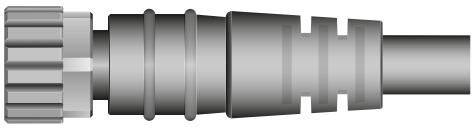
M8 6pin Socket (MALE, A-CODING)- Pin assignation



Interface Name	M8 Pin assignation
5VDC Voltage	PIN 1
DATA -	PIN 2
DATA +	PIN 3
Not used	PIN 4
Not Used	PIN 5
GND	PIN 6

M8 6pin Plug (FEMALE, A-CODING)- Pin assignation





M8-6Pins Plug

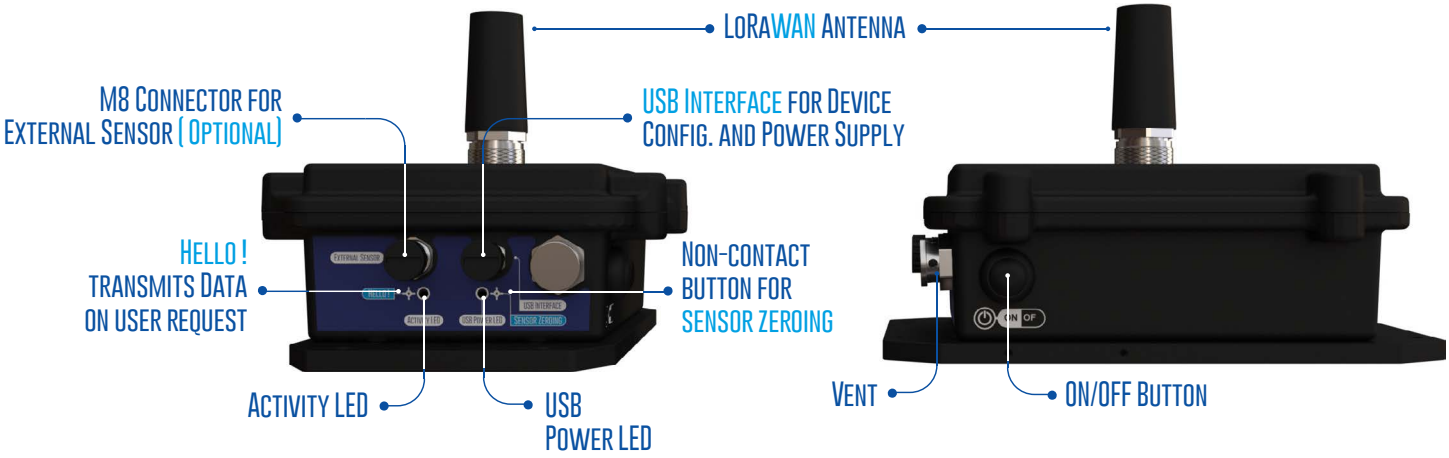
Interface Name	5VDC Voltage	USB DATA -	USB DATA +	Not used	Not Used	GND
M8 Pin assignation	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6
Wire Color (A-coding)	BROWN	WHITE	GREY	BLUE	GREEN	PINK

9 DIFFERENT ANTENNA VERSIONS

HIGH GAIN ANTENNA 5DBI

SMALL FORM FACTOR ANTENNA 2DBI

10 OVERVIEW



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